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(56) Documents cited  
GB 2028658 A US 4373547 A

(58) Field of search  
UK CL (Edition L) B4Q, F2B  
INT CL<sup>5</sup> A61L, B25J

## (54) Improvements in and relating to apparatus for protective access

(57) A flexible link is provided between a protective enclosure for an operator and an access port in process equipment which is normally closed by a door to accommodate opening of the door and to permit free access for loading and unloading the chamber. In one arrangement there is provided an enclosure 10 for sealing an access 6 to an isolation chamber 2 which is normally closed by a door 8 which opens outwardly. The enclosure is sealed to the chamber around the door opening and is provided with a pocket 14 to accommodate the protruding door when it is opened. An expansible region 16 in the enclosure permits movement of at least a membrane containing region towards and away from the chamber. The membrane includes integral shaped gloved sleeves and/or a half suit and the expansible region is typically in the form of bellows which extend around the door opening or may be a number of sealed telescopic sections.

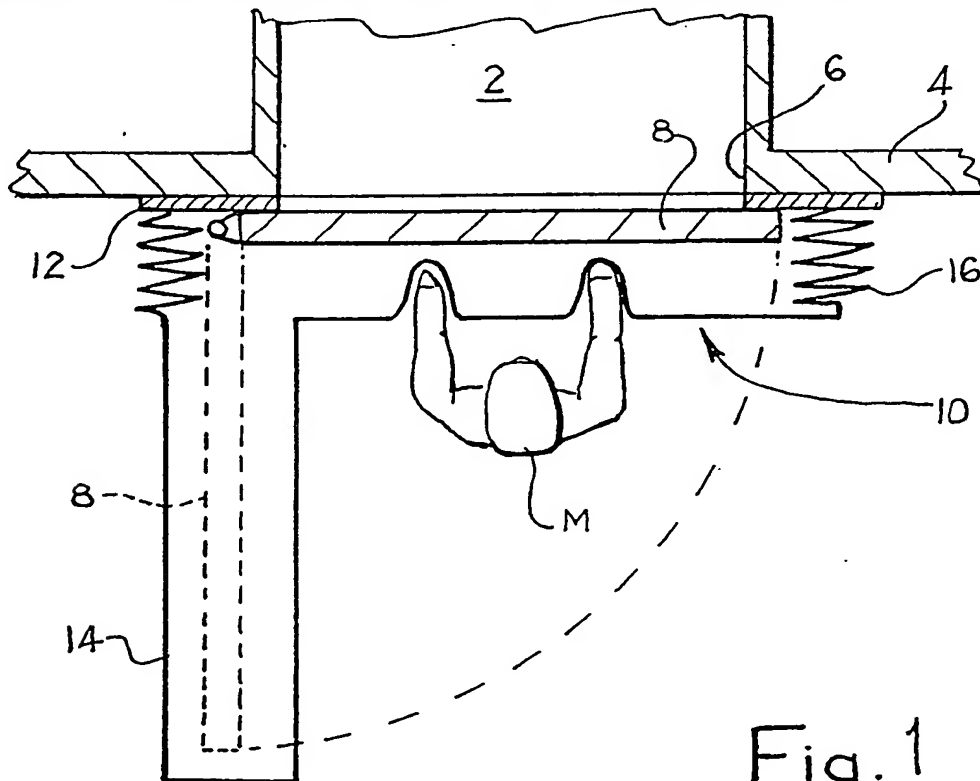
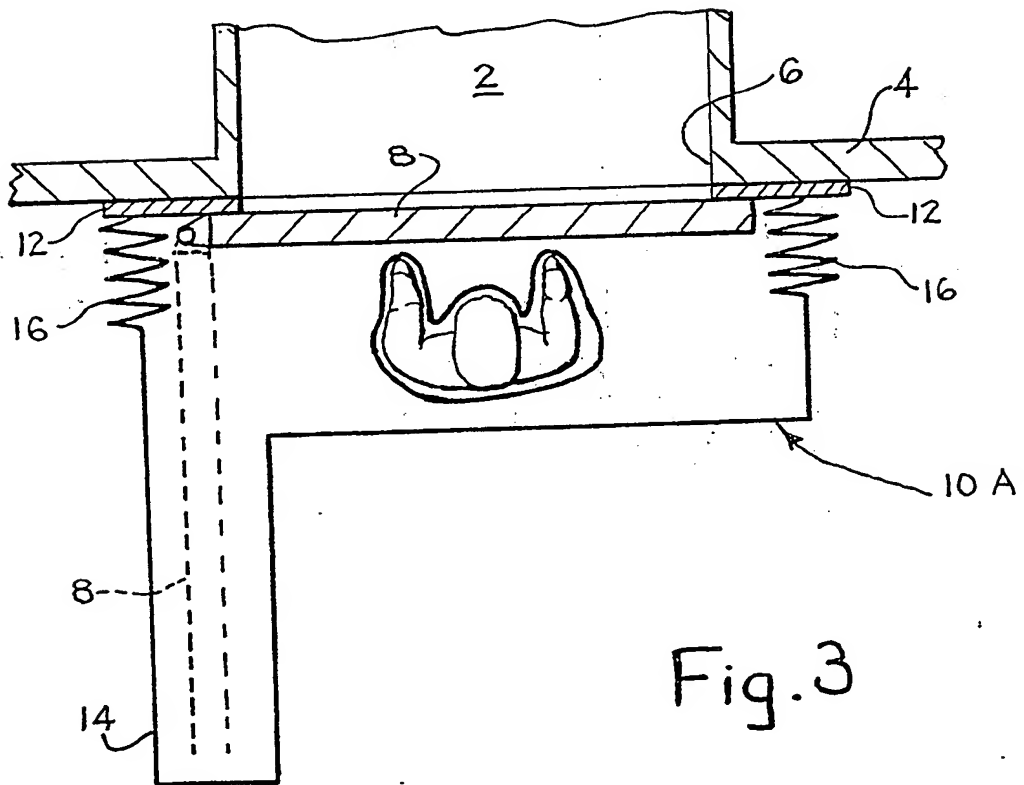
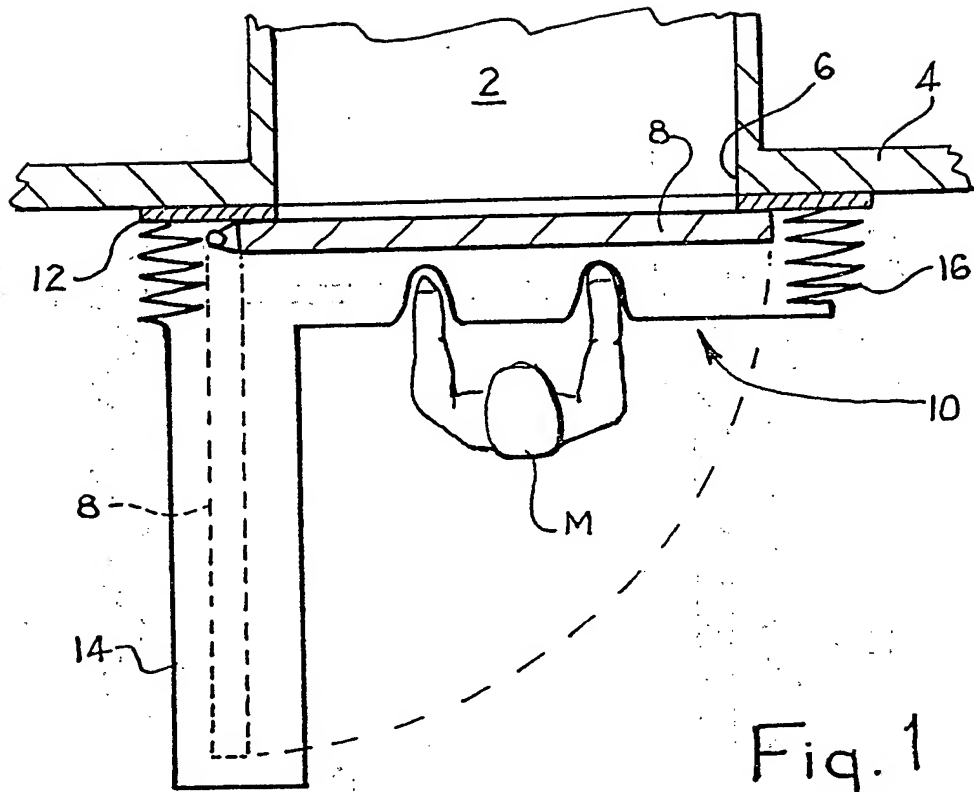


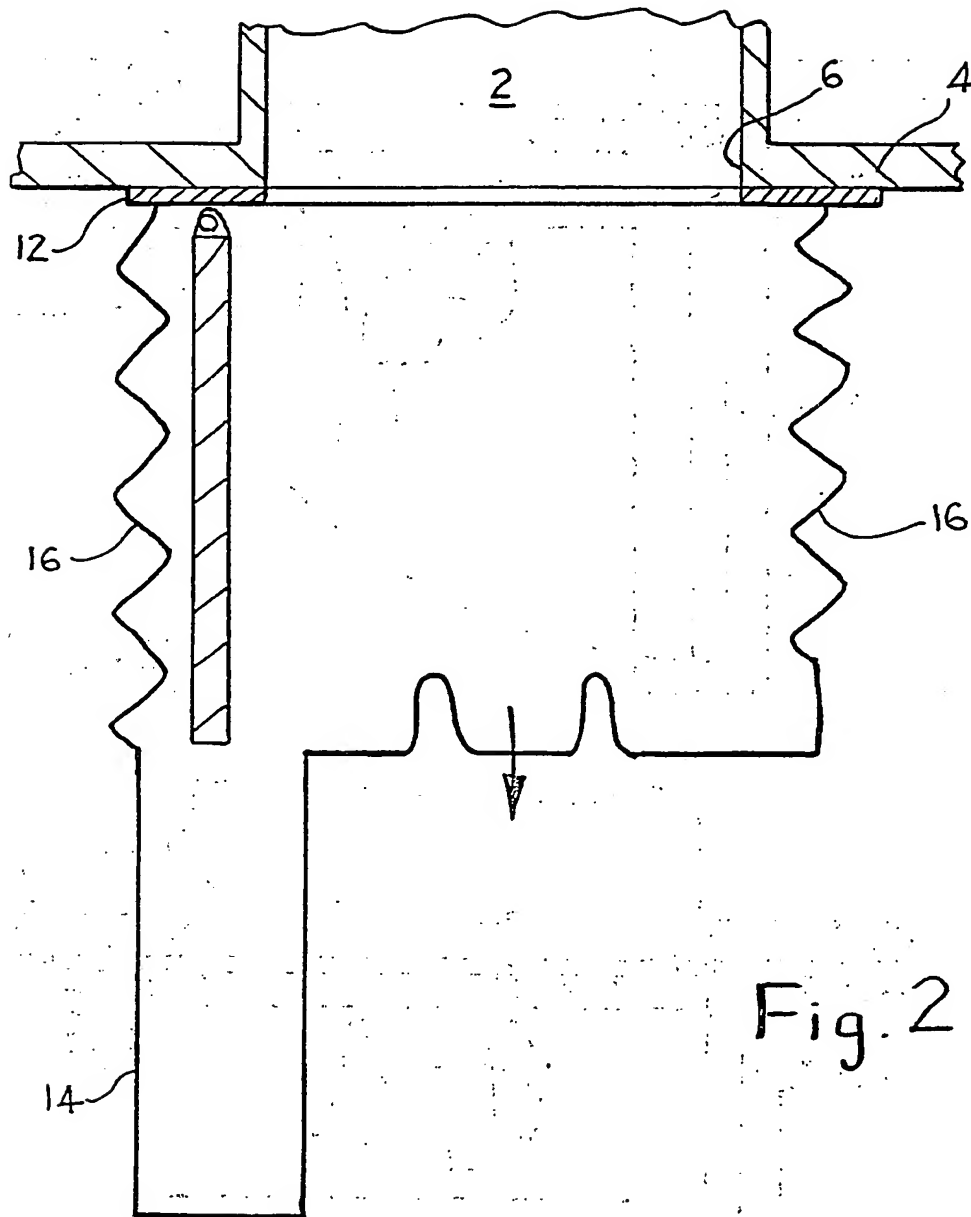
Fig. 1

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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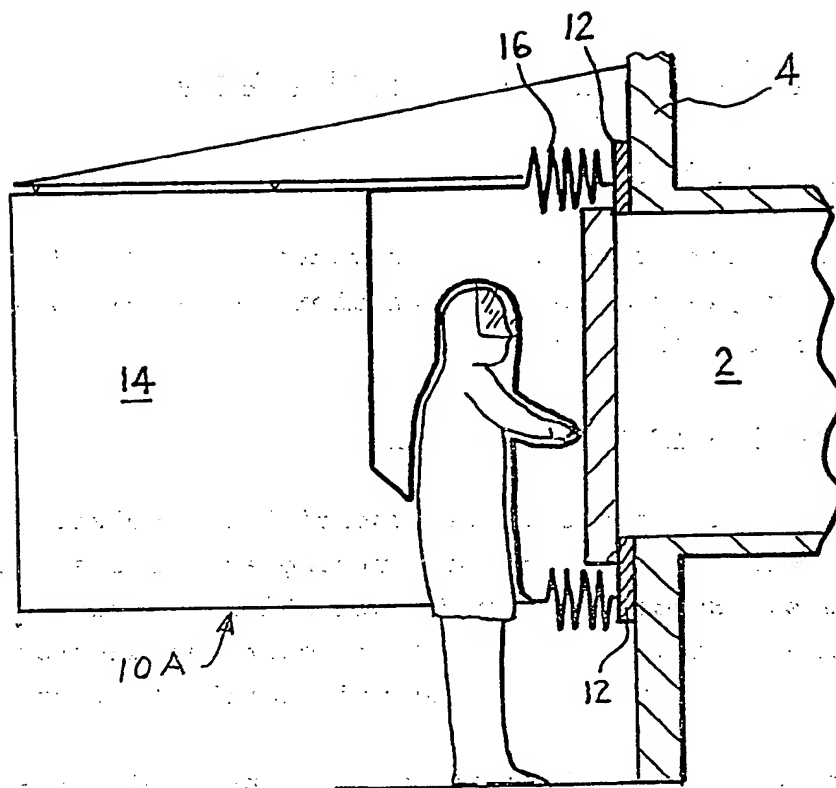


Fig. 4

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Title: Apparatus for Protective Access

Field of invention

This invention concerns apparatus for protective access for example to isolation chambers autoclaves, freeze dryers and the like.

Background to the invention

In many situations it is essential to isolate the interior of a chamber from the surrounding atmosphere during access. Examples of such activities include medical and pharmaceutical research, pharmaceutical manufacture and testing, sterility testing and sterile filling lines.

In order to provide sterile or controlled atmosphere environments around such equipments, it is necessary to enclose all apertures and control the atmosphere within each such enclosure.

It is an additional problem with large process equipment such as freeze dryers, autoclaves etc, to provide the enclosure or enclosures in such a manner as not to restrict either the opening of the access door or the loading or unloading of the chamber.

It is an object of the present invention to provide apparatus in the form of an enclosure for such openings which does not restrict the opening of the door to the chamber and yet permits access to the interior for

unloading and loading of the chamber.

Summary of the invention

According to one aspect of the present invention there is provided an enclosure for sealing an access to an isolation chamber which is normally closed by a door which is openable outwardly wherein the enclosure is sealingly secured to the chamber around the door opening, is shaped at least in part to accommodate the protruding door when the latter is opened and includes a flexible membrane which serves as a protective covering for at least the hand and arm of an operator by means of which the latter can reach forward towards the chamber to open and shut the door, and an expansible region permitting movement of at least the membrane containing region of the enclosure towards and away from the chamber.

The membrane may include one or more integral gloved sleeves.

In addition or alternatively the membrane may comprise a so-called "half suit" consisting of a helmet and integral upper body vest from which sleeves extend for covering the upper half of an operators body and which is sealingly secured around an opening through which the operators body can protrude from below and outside the enclosure.

The expansible means may take the form of a bellows extending around the door opening.

Alternatively the expansible means may be a plurality of sealed telescopic sections.

The expansible means may in addition permit movement of the relatively movable portion of the enclosure laterally relative to the face of the chamber, thereby to enable an operator to move himself together with at least part of the enclosure laterally across the face of the chamber opening to facilitate loading and unloading and access to the interior of the chamber.

Particularly in the case of a half suit, the expansible means may be formed around the half suit to enable the operator to move relative to the rest of the enclosure towards and away from the opening and laterally relative thereto.

The enclosure may be of box-like configuration and have either a flexible or rigid shell or a combination thereof.

According to another aspect of the present invention there is provided a flexible link between a protective enclosure and the face of process equipment containing an access port to allow free access to open a door normally closing the access port for loading and unloading the chamber.

Where the enclosure takes the form of a relatively rigid box-like structure it must be linked to the equipment by a sealing arrangement which is sufficiently flexible to permit all the relative movement needed.

Alternatively where the enclosure is formed partly as a rigid shell and partly from flexible material, the latter must provide at least an expansible joint between the rigid shell and the equipment or at least between the rigid shell and a membrane through which the operator can

gain access to the equipment.

The invention thus proposes an expansible link between process equipment and an enclosure such that an operator can move in and out in relation to the face of the equipment to permit a door to be unlatched, swung open outwardly to give access to the interior and to swing the door closed and latch it.

The invention thus allows a protected operator to approach equipment, manipulate the door closure mechanism and in moving away, open the door. Once the door is open, the invention allows the operator to move in again to access the interior of the chamber or equipment, to load or unload the latter and finally to move in to close and secure the door.

By providing for lateral or sideways movement, the invention also allows the operator to move laterally relative to the opening and thereby give access to a greater volume of the interior than has hitherto been possible.

The invention can be adapted to all applications where an operator position needs to have unrestricted movement over a large area the whole of which needs to be a protected environment.

#### Description of the drawings

The invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a plan view of apparatus constructed in



accordance with the invention;

Figure 2 is a plan view similar to Figure 1 but with the enclosure in a rearwardly extended position;

Figure 3 is a plan view of a second embodiment of the invention which incorporates a so-called half suit; and

Figure 4 is a side view of the apparatus shown in Figure 3.

Detailed description of the drawings

Referring first to Figures 1 and 2, there is shown an isolation chamber 2 such as a freeze dryer, having a thick wall 4 typically including insulation material, in which is formed an opening 6 closable by a hinged door 8 which is openable outwardly and typically circular in shape.

Formed against the wall 4 is an expansible enclosure 10 secured to the wall by a seal 12 so that the interior of the enclosure is entirely isolated from the surrounding atmosphere and is sealingly in communication with the interior of the chamber when the door is opened. Adjacent the seal 12, the enclosure is provided with a bellows 16 of multiple V formation, enabling the enclosure to be moved away from and towards the chamber so that it can also occupy the position shown in Figure 2 without affecting the integrity of the sealing.

The enclosure is essentially a box-like air impervious shell and is generally L-shaped when viewed in plan. The rearwardly extending hollow protrusion or pocket 14 serves to accommodate the door 8 when the latter is opened.

Formed in the enclosure opposite the opening 6 is a pair of integrally gloved sleeves 18 into which an operator M can insert his hands and forearms to permit him to reach into the interior of the enclosure and operate the door closure mechanism.

In use as the operator opens the door 8 he steps backwards, bringing the enclosure with him, as the bellows 16 expand. When the operator M reaches the position shown in Figure 2, the door can be swung fully open within the enclosure, and the operator can then move forward again towards the now unrestricted opening. The door 8 fits into the pocket 14.

In the unrestricted forward position, the operator is able to reach into the chamber to remove or load containers or samples or the like.

The embodiment shown in Figure 3 is similar to that shown in Figures 1 and 2 save that in place of the gloved sleeves 18, there is provided a known half suit 20 into which the operator can insert the upper half of his body as best seen in the side view of Figure 4. In order to accommodate the half suit, the enclosure 10A may need to be larger than the enclosure shown in Figures 1 and 2.

The connection between the enclosure 10A and the half suit 20 is preferably made flexible for example by the use of a further bellows (now shown) to allow the operator to turn and/or to move laterally relative to the chamber. The operator is therefore permitted substantially unrestricted movement not only towards and away from the chamber 2 but also laterally relative thereto.

## Claims

1. An enclosure which seals access to an isolation chamber which is normally closed by a door which is openable outwardly wherein the enclosure:
  - (1) is sealingly secured to the chamber around the door opening,
  - (2) is shaped at least in part to accommodate the protruding door when the latter is opened,
  - (3) includes a flexible membrane serving as a protective covering for at least the hand and arm of an operator by means of which the latter can reach forward towards the chamber to open and shut the door,
  - (4) and further includes an expansible region permitting movement of at least the membrane containing region of the enclosure towards and away from the chamber.
2. An enclosure as claimed in claim 1 which includes one or more integral gloved sleeves.
3. An enclosure as claimed in claim 1 or 2 wherein the membrane comprises a "half suit" consisting of a helmet and integral upper body vest from which sleeves extend for covering the upper half of an operators body and which is sealingly secured around an opening through which the operators body can protrude from below and outside the enclosure.
4. An enclosure as claimed in claim 1, 2 or 3 wherein the expansible means takes the form of a bellows extending around the door opening.
5. An enclosure as claimed in claim 1, 2 or 3 wherein the expansible means takes the form of a plurality of sealed telescopic sections.
6. An enclosure as claimed in any of the preceding claims wherein the expansible means permits movement of the relatively movable portion of the enclosure laterally relative to the face of the chamber.
7. An enclosure as claimed in claim 1, 3, 4, 5 or 6 wherein the expansible means is formed around the half suit to enable the operator to move towards, away from and laterally relative to the enclosure.
8. An enclosure as claimed in any of the preceding claims wherein the enclosure is of a box-like configuration.
9. An enclosure as claimed in any of the preceding claims wherein the enclosure is of a flexible or rigid nature or combination thereof.

10. A flexible link situated between a protective enclosure and the face of process equipment containing an access port, wherein free access is allowed to open a door normally closing the access port, for loading and unloading the process equipment.
11. A flexible link as claimed in claim 10 wherein the enclosure is a relatively rigid structure and the seal to the equipment is sufficiently flexible to permit all the relative movement required.
12. A flexible link as claimed in claim 10 wherein the enclosure is formed partly as a rigid shell and partly from flexible material, and the latter provides an expansible joint is provided between the rigid shell and the equipment or between the rigid shell and a membrane.
13. A flexible link as claimed in any of claims 10 to 12 whereby an operator is allowed to move laterally relative to the opening.
14. Methods and apparatus for protecting an operator whilst opening or closing a door to an isolation chamber substantially as herein described by way of example with reference to and as illustrated in the accompanying drawings.

Patents Act 1977

Examiner's report to the Comptroller under  
Section 17 (The Search Report)

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Relevant Technical fields

(i) UK Cl (Edition 1) BAQ, F2B

(ii) Int Cl (Edition 5) A61L, B25J

Search Examiner

R L WILLIAMS

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

22 FEBRUARY 1993

Documents considered relevant following a search in respect of claims

1-9 AND 14

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2028658 A (VICKERS LTD)	1, 2, 8 and 9
A	US 4373547 (WAGEIS ET AL)	1

Category	Identity of document and relevant passages	Relevant to claim(s)

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